Arborist Report
Tree Preservation Plan – William Hawrelak Park

Development Permit No: 426720802-002
April 20, 2023

REVISION HISTORY				
Revision #	**Date**	**Revision Reason**	**Reviewed By**	**Approving Body**
0	March 8, 2023	Original Document	Dylan Buchanan, CHANDOS Construction	Erin Bayus, Urban Forester Natural Areas Laurie Lacey, Urban Forester Open Spaces
1	April 20, 2023	Includes all Areas 1 through 19	Dylan Buchanan, CHANDOS Construction	Erin Bayus, Urban Forester Natural Areas Laurie Lacey, Urban Forester Open Spaces

Prepared for:

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April 20, 2023

Dylan Buchanan
Project Manager
CHANDOS Construction Ltd.
9604 20th Avenue,
Edmonton, Alberta
T6N 1G1

Dear Mr. Buchanan:

RE: Tree Preservation Plan – William Hawrelak Park
(Project No: ECN 6.1. 2023)

This report summarizes our field observations of existing tree locations, their condition, and details of potential damage or injury related to the rehabilitation project at William Hawrelak Park.

Plans produced in this report combine GIS layers provided from other parties including Watt Consulting Group, PFS Studio, The Marc Boutin Architectural Collaborative, Williams Engineering and Marker Geomatics Inc. This report identifies likely conflicts between existing trees and construction related to the rehabilitation of Hawrelak Park. Preliminary recommendations are provided to mitigate those conflicts prior to construction and post construction. All final decisions of tree protection or tree removal will be made at site on an ongoing basis engaging CHANDOS and City of Edmonton Urban and Natural Areas representatives.

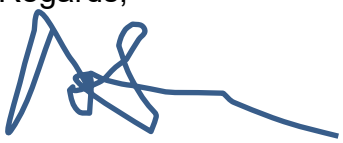
The Tree Preservation Plan outlines preliminary tree protection requirements for open spaces and natural areas. Amendments or updates to this plan will be submitted on as needed basis.

As of April 13th, 2023 the protection status is summarized below:

	Numbers of Trees
Total number of open space trees impacted – within Tree Protection Zone (TPZ)	741
Total estimated number of trees to protect	544
Total estimated number of trees to remove	112
Trees impacted by current grading and COE protection requirements	85
Commemorative trees identified within the development site	35

Please get back to me if you have any questions or concerns with this report.

Regards,



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1.0 Introduction

The purpose of this report is to inventory locations and tree information from site observations of City of Edmonton trees within William Hawrelak Park (Figure 1). Recommendations for trees are consistent with tree preservation requirements in the Public Tree Bylaw 18825, and the associated June 2022 Tree Preservation Guidelines. This tree preservation plan has been requested by the City of Edmonton in support of Development Permit application 426720802-002.

The property addresses and legal descriptions are as follows:

9330 – Groat Road NW Plan 6075AM Blk X
9350 – Groat Road NW – Plan 6075AM Blk X
9330 Groat Road NW – Plan EDMONTON Lot 1

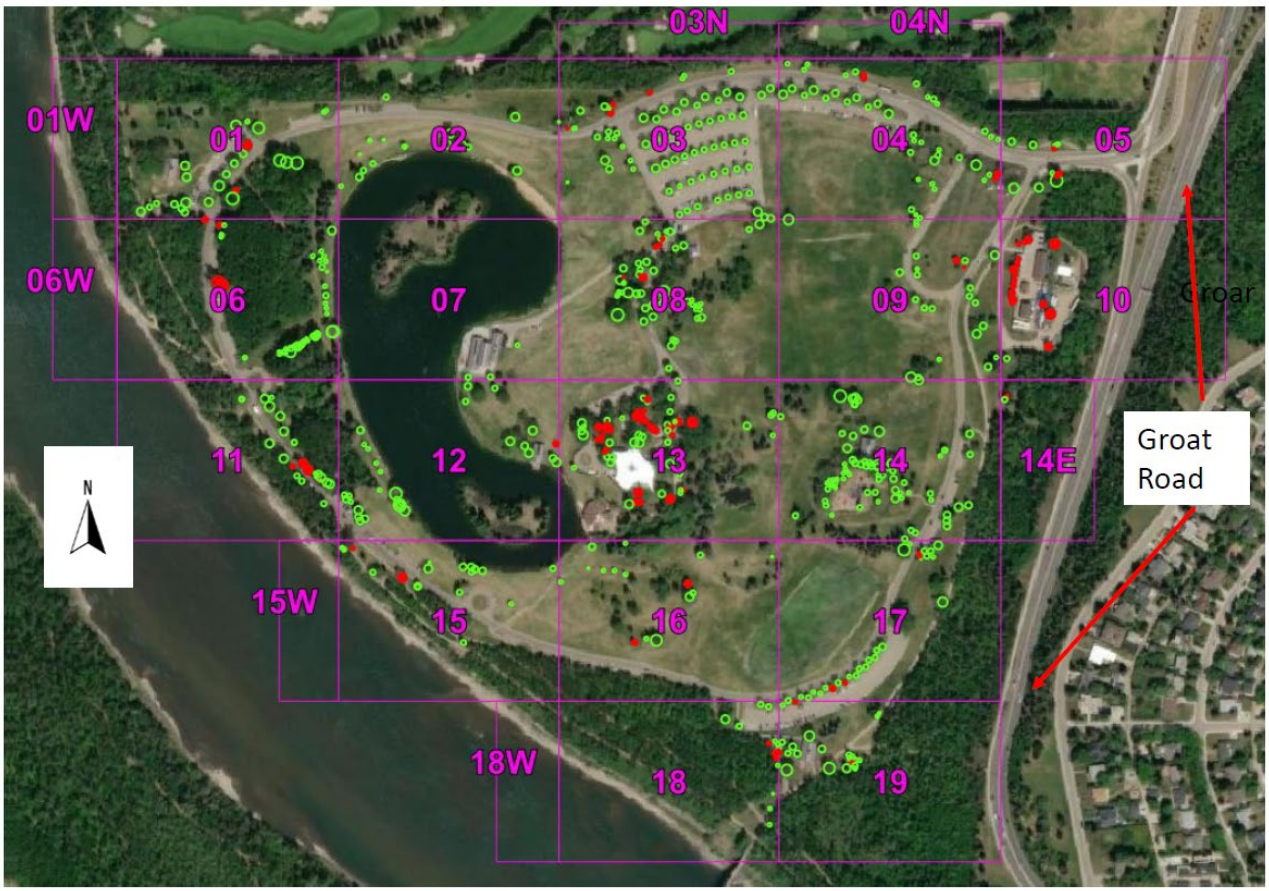

Figure 1. Hawrelak Park – Development Site.

2.0 Demolition and Construction

Plans provided for the rehabilitation of Hawrelak Park indicate demolition and construction activities in open spaces and natural areas including the removal and replacement of surface and underground infrastructure.

Rehabilitation work will involve the following

Utilities

- Replacing the entire storm sewer systems
- Upgrading power, gas and telecommunication infrastructure
- Replacing the irrigation system
- Replacing the entire water distribution system within the park

Facilities

- Updating the main pavilion, plaza, boathouse, washroom shelters, 2 buildings in the service yard as well as an extension to the main building
- Adding a new storage facility for the Heritage Amphitheatre

Open spaces

- Replacing the paddle boat dock, playground
- Adding shared use paths
- Regrading to improve drainage
- Repaving all roads and replacing all road curbing
- Adding lighting for security

The projected start date is April 2023 with subsequent construction ending in winter 2025/2026.

2.1 Material Stockpiling and Equipment Access Plan

Equipment access and egress routes, and areas designated for staging of equipment and materials are located in the **Appendix 1** Material Stockpiling and Equipment Access Plan. There are 2 designated stockpiling areas and 1 area identified for hazardous materials recycling for this project.

The main access and egress route will be the existing ring road. Three additional routes have also been identified in **Appendix 1.**

3.0 Site Assessment and Mapping

3.1 Methods

The methods used to benchmark the condition of the natural areas and the open space trees is outlined below.

3.11 Natural Areas

The 2015 City of Edmonton Urban Primary Land and Vegetation Inventory (uPLVI) was used as the basis to classify the natural areas within Hawrelak Park (**Figure 2, Table 1**). The field work included establishing 1 transect throughout each of the 5 polygons from **Table 1** to assess stand composition and condition. Every effort was made to ensure representativeness of the average condition of the natural area and minimize influence of edge effects.

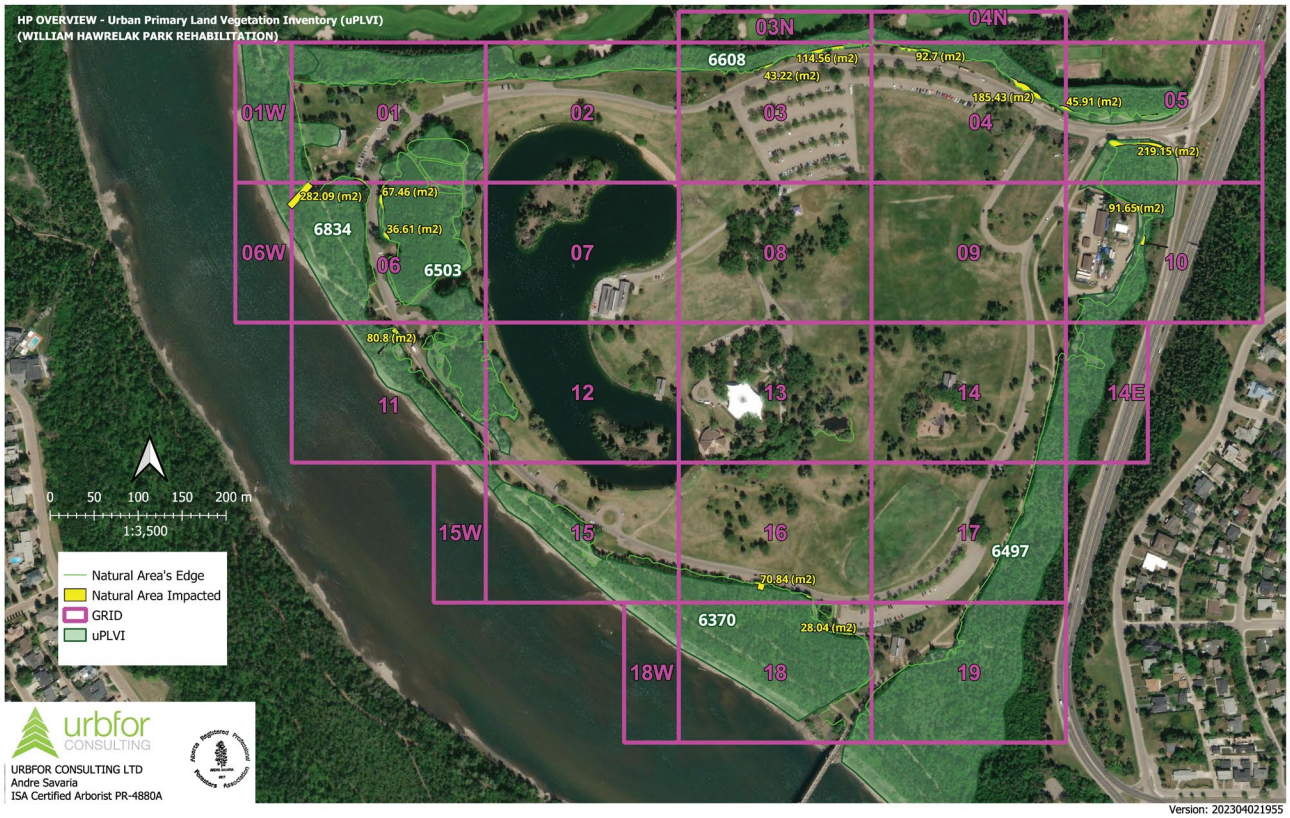

Figure 2. Natural Area Polygons as per Urban Primary Land and Vegetation Inventory (uPLVI).

This inventory identified 5 key forested site types.

Table 1. Summary of Key Forested Types within Natural Areas.

Polygon ID	Stand Type	Density Class %	%Coniferous Tree Species	Leading Tree Species	Pioneer Succession Stage
6834	Balsam Poplar	51 – 70	10	Balsam poplar	Mature
6370	Balsam Poplar/ Trembling Aspen	71 – 100	0	Balsam poplar/ white birch	Mature
6503	Balsam Poplar/Trembling Aspen	71 – 100	10	Balsam poplar/ white birch	Mature
6608	Coniferous Leading Mixedwood	51 - 70	70	White spruce	Mature
6497	Balsam Poplar	51 - 70	0	Balsam poplar	Breakup

The Rangeland Health Assessment for Grassland, Forest and Tame Pasture Field Workbook (Adams, 2016) was used to determine the current status and condition of identified forest types within natural areas. This assessment served as a visual system to readily see changes in forest and natural area health. A scoring system is used to quantify condition.

Forested types within natural areas were assessed in the field to confirm:

- Dominant tree and shrub species and condition
- Current seral stage (status)
- Forest plant community structure (i.e., vegetation layers)
- Changes in surface organic layer (LFH thickness and compaction)
- Drainage direction and erosion and sedimentation concerns
- Areas of high use showing vegetation decline and/or compacted soils
- Environmental sensitivity, including unique or rare species/landforms
- Presence of prohibited noxious and/or noxious weeds

Changing weather conditions limited stand observations to a minor extent due to snow cover and leaf off conditions. This includes site visits to map all polygons on April 1 and 2, 2023.

3.12 Open Space Trees

The original tree inventory produced for this report was completed in July and August of 2020.

Open Areas:

i. Unique tree identifier
ii. Trees defined as >60 mm at breast height
iii. Conifer vs deciduous
iv. Species; common and scientific name
v. Diameter at breast height (DBH) in Millimetres (mm)

vi. crown width in Metres (m) – open trees only; 1 measurement of average crown
vii. shrubs [1]
viii. Comments – as required

[1] A **shrub** is a small- to medium-sized perennial woody plant. Unlike herbaceous plants, **shrubs** have persistent woody stems above the ground. They are distinguished from trees by their multiple stems and shorter height

The trees were mapped using a GEO7x explorer GPS with a data accuracy of 0.1 to 0.3 metres.

In early January 2023, further assessment field work was initiated and included:

i) Documenting existing site conditions
ii) Confirming the inventory of affected City of Edmonton (COE) trees in open spaces, updating the following
    i. Trunk diameter at breast height (1.4 m) above ground
    ii. Tree species, common name and scientific name
    iii. Tree height in metres (m)
    iv. Crown length in metres (m)
    v. Trees cut since 2020
iii) Trees to be removed
iv) Proposed soil mitigation measures to prevent root damage/ impacts as well as potential soil compaction
v) Site factors that may impact tree health and survival (i.e., existing versus final grade)
vi) Overall tree health including abiotic impacts to tree roots, trunk and crown
vii) Current condition code for crown, branch, trunk, roots and root collar as per City of Edmonton Guidelines for Evaluation of Trees and **Table 2** below.

Table 2. Summary of Tree Condition Codes.

Percent (%)	Description
100	Perfect tree or specimen quality
90	Excellent Tree
80	Very Good Tree
70	Above Average Tree
60	Good or Average Tree
50	Below Average Tree
40	Fair Tree
30	Poor Tree
20	Very Poor Tree

The chemical properties of the soil were not assessed.

4.0 Trees and Construction Conflict Analysis

Construction disturbances and working area buffers were represented as GIS polygons. These GIS polygons were used to calculate the area (m^2) of disturbances.

4.1 Methods

All of the most recent design plans were obtained and used to generate overlays onto the natural area boundary in the park. These data sources are summarized in **Table 3.**

Table 3. Summary of Data Type and Source.

DATA TYPE	FILENAME	Source
New Electrical	0042566.00-A0-E_POWER.dxf	Williams Engineering
New Electrical Equipment	0042566.00-A0-E_POWER.dxf	Williams Engineering
New Electrical Lights	0042566.00-A0-E_POWER.dxf	Williams Engineering
New Sanitary	3776.E01.C-106 - SANITARY SEWERS SERVICING PLAN-Model.dxf	Watt Consulting Group
New Storm	3776.E01.C-105 - STORM SEWERS SERVICING PLAN-Model.dxf	Watt Consulting Group
New Water	NEW 3776.E01.C-107 - WATER MAINS SERVICING PLAN-Model (exported).dxf	Watt Consulting Group
New Catch Basin/Manhole	3776.E01.C-105 - STORM SEWERS SERVICING PLAN-Model.dxf	Watt Consulting Group
New Paths	20015 HAWRELAK PARK - Landscape Base.dxf	PFS Studio
New_Roads_Curb	20015 HAWRELAK PARK - Landscape Base.dxf	PFS Studio
Staircase	20067-TOPO-102821-CLIENT.dxf	Marker Geomatics
Natural Area Boundary	20067-TOPO-102821-CLIENT.dxf	Marker Geomatics
Ski trails	20015 HAWRELAK PARK - Landscape Base.dxf	PFS Studio
Retaining Walls	20015 HAWRELAK PARK - Landscape Base.dxf	PFS Studio
BBQ's	20015 HAWRELAK PARK - Landscape Base.dxf	PFS Studio
Outfall Areas	20015 HAWRELAK PARK - Landscape Base.dxf	PFS Studio
Grading	3776.E01.C-102 - OVERALL SITE GRADING PLAN.dxf	Watt Consulting Group

The applicable disturbance width and working area buffer for each disturbance type is outlined in **Table 4**.

Table 4. Summary of Disturbance Types, Applicable Widths and Working Area Buffers.

Disturbance Type	Disturbance Width Applied (m)	Working Area Buffer (m)	Comments
New Electrical	**1.0**	**0.5**	From the identified electrical line in CAD, a 0.5 meter buffer was applied to the line resulting in an area of disturbance of 1.0 meters across; delete new electrical in AREA 10 as per Nikirk email of March 3, 2023; See Table 2 for source
New Electrical Equipment	**variable**	**3.0**	A 3.0 meter buffer was applied to the footprint of the new equipment provide from CAD. Eg a 2.0x2.0 equipment would end up as 5.0 x 5.0 to allow for installation; See Table 2 for source
New Electrical Lights	**variable**	**3.0**	3.0 meters from around the identified light standard location in CAD; See Table 2 for source
New Sanitary	**6.0**	**3.0**	From the identified sanitary line in CAD a 3.0 meter buffer was applied to the line resulting in an area of disturbance of 6.0 meters across.; See Table 2 for source
New Storm	**8.0**	**4.0**	From the identified storm line in CAD, a 4.0 meter buffer was applied to the line resulting in an area of disturbance of 8.0 meters across; See Table 3 for source
New Water	**6.0**	**3.0**	From the identified sanitary line in CAD, a 3.0 meter buffer was applied to the line resulting in an area of disturbance of 6.0 meters across.; deleted new water in AREA 10,14 and 17 as per Buchanan email of March 2, 2023; See Table 3 for source
New Catch Basin/Manhole	**variable**	**3.0**	a 3.0 meter buffer was applied to the footprint of the new catch basin from CAD. Eg a 1.0x1.0 catch basin would end up as 5.0 x 5.0 to allow for installation; See Table 3 for source
New Paths	**variable**	**0.3**	From the identified back of curb line in CAD a 0.3 meter buffer was applied to allow for the installation of the new curb form; See Table 3 for source
New_Roads_Curb	**variable**	**0.5**	From the identified back of curb line in CAD a 0.3 meter buffer was applied to allow for the installation of the new curb form.; See Table 3 for source
Staircase	**none**		No disturbance anticipated with current construction methods
Ski trails	**none**		No disturbance anticipated
Retaining Walls			Retaining walls still under design; this work will not be in 2023; it is a remove and replace so impacts should not be substantial (see Buchanan email of March 2, 2023)
BBQ's	**none**		No disturbance anticipated
Outfall Areas			See 3590 Hawrelak Park Foliage Removal 230112 (NW); 3590 Hawrelak Park Foliage Removal (South)
Grading	**variable**		Intersected latest March 3, 2023 grading plan over natural area boundary to determine aera (m2) impacted.

All of the most recent point, line and polygon data sets were imported to QGIS Ver.3.28 from a CAD (dxf) file format.

The intersected data was compiled with the following assumptions:

i. The **natural area boundary line** – The boundary line used in this analysis was originally collected in 2020 from Marker Geomatics (file: 20067-TOPO-102821-CLIENT)

ii. The **area disturbed** was comprised of
   - New installations of utilities including storm water, water, sanitary and electrical; grading

- All new paths within the park

iii. This analysis excluded all **trails** west of the ring road

iv. All **existing utilities** are to be abandoned and do not constitute a potential disturbance

v. Installation of **new utilities** that involve trenchless technology can further reduce this area of disturbance

vi. The **natural area boundary** line used was likely collected in 2020 which was the date of the initial inventory; therefore, there may be new areas of tree/ shrub encroachment into the park as well as areas recently groomed that are outside of the original boundary

4.2 Open Space Trees

A GIS buffer tool was utilized to generate a 5 m tree protection zone (TPZ) radius polygon around each individual tree in open spaces. Construction plans for new utilities or infrastructure overlapping these individual tree buffers (**Figure 3**) triggers recommendations for tree assessment, protection, or removal.

Figure 3. Example of GIS Utility Overlay for Identifying Conflicts.

This preservation plan will only address those “planned disturbances” that fall within the identified TPZ using **Table 5** minimum protection distance multipliers.

Table 5. Tree Protection Zone Calculation Table.

TREE PROTECTION ZONE CALCULATION TABLE		
TRUNK DIAMETER (DBH)	TRUNK CIRCUMFERENCE	MIN. PROTECTION DISTANCE
< 10cm	< 31cm	1.2 METERS
11 - 30cm	34 - 94cm	1.8 METERS
31 - 40cm	97 - 125cm	2.4 METERS
41 - 50cm	129 - 157cm	3.0 METERS
51 - 60cm	160 - 189cm	3.6 METERS
61 - 70cm	192 - 220cm	4.2 METERS
71 - 80cm	233 - 251cm	4.8 METERS
> 80cm	> 251cm	5.0 METERS

- MIN PROTECTION DISTANCE IS MEASURED FROM OUTSIDE EDGE OF TREE TRUNK FROM EACH SIDE.
- DBH = DISTANCE AT BREAST HEIGHT

5.0 Results

5.1 Natural Area Assessment

The estimated total area to be disturbed within the natural area is approximately 1,512 m^2. The following is a breakdown of natural area disturbed (m^2) by disturbance type previously shown in **Table 3**.

Table 6. Summary of Impacts to Natural Areas (NA) by Disturbance Type.

Natural Area ID	Area Disturbed Inside NA (m^2)	Area Disturbed Outside of NA (m^2)	Conflict	Comments
0		143.81	New_Storm	Outfall #25; case bore, no excavation or disturbance in NA
1		148.65	New_Sanitary	no disturbance to NA, existing pipe to be lined
4		177.88	New_Water	water line to be DD, small receiving pit in ditch
5	70.84		New_Electrical, New_Electrical_Equipment	
6	36.61		New_Electrical	
8	114.56		CUT_Fill, New_Electrical, New_SUP	
9	92.7		CUT_Fill, New_Electrical, New_SUP	
10	185.43		CUT_Fill, New_Electrical, New_Electrical_Equipment, New_SUP	
11	45.91		CUT_Fill	
12	23.38		New_Electrical, New_Electrical_Equipment	
13	219.5		CUT_Fill, New_SUP, New Storm	
14	91.65		New_Electrical	
15	65.71		New_Electrical, New_Electrical_Equipment	
16		1386.25	New_Electrical, New_SUP, CUT_Fill	electrical moved under path; no NA disturbance
17		29.3	New_Electrical, CUT_Fill	electrical moved under path; no NA disturbance
18		274.04	New_Electrical, CUT_Fill	electrical moved under path; no NA disturbance
19	28.04		CUT_Fill, New_SUP	
20	20.02		New_Electrical, New_CBAS_Manhole	
21	80.8		New_Electrical, New_Electrical_Equipment	
22	67.46		CUT_Fill, New_Electrical, New_SUP	
23	44.82		CUT_Fill, New_Electrical, New_Water, New_Storm, New_CBAS_Manhole, New SUP	
24	282.09		New_Storm	
25	43.22		New_Electrical, CUT_Fill, New_SUP	
Total (m^2)	**1512.74**	**2159.93**		

Recommendations to mitigate the impact of these disturbances is further outlined in section 6.1 of this report and Appendix 6, 7 and 8.

5.1.1. Natural Area Health Assessment Results

The results of the natural area health assessment are summarized below by polygon ID provided in **Table 1**.

6834 – This stand is largely comprised of mature ~14-meter-tall balsam poplar (*Populus balsamifera*) in the overstory at an approximate density of 70% with pockets of white spruce (*Picea glauca*). A small number of white birch (*Betula papyrifera*) were also noted in both the overstory and understory. There is a dense understory of red osier dogwood (*Cornus stolonifera*) in the 2 – 4 meter height range as well as prickly rose (*Rosa acicularis*). Smaller white spruce seedlings/ saplings ranging in height from 0.5 to 5.5 metres were noted where canopy gaps occur. Trembling aspen (*Populus tremuloides*) was also noted in the understory. The stand is relatively flat on the east side and slopes gradually west towards the Saskatchewan River. There are two pedestrian trails that extend north and southeast through this stand.
The plant community type was assessed as “PB. 3 red-osier dogwood” as per the Urban Ecological Field Guide for the City of Edmonton. The overall forest health assessment score was in the “healthy” range at ~ 86 %.

6370 - This stand is largely comprised of 2 layers with a mature ~13 meter-tall balsam poplar (*Populous balsamifera*) in the overstory at an approximate density of 70% with some standing dead balsam poplar. Aspen trees (*Populus tremuloides*) at ~ 10 metres tall are growing under existing balsam poplar. Mountain ash (*Sorbus americana*) stems reach 5 metres in height and Manitoba Maple (*Acer negundo*) was recorded at 9 metres. Oak (*Quercus sp.*) was noted in the understory as well. There is a well established understory of low bush cranberry (*Viburnum trilobum*) in the 2-meter height range. White spruce (*Picea glauca*) seedlings/saplings were noted in the southeast corner of this stand. There is significant dead fall throughout the central portions of the stand – some resulting from wind events. Protective metal cages were noted on selected balsam poplar. Chewing injury was observed on multiple balsam poplar trees from beavers at the southwest portion of the stand. The site is relatively flat and stable and there are slopes of up to 25 percent towards the South Saskatchewan River. Two distinct walking trails extend southeast and northwest in this stand.

The plant community type was then assessed as “PB. 1 mixed shrubs” as per the Urban Ecological Field Guide for the City of Edmonton. The overall forest health assessment score was in the “healthy with problems” range at ~ 65%. This is largely due to the dieback observed with poplar, the lack of species diversity and regenerating conifer/ deciduous species.

6503 – This stand lies west of the lake and east of the ring road. The overstory trees species include balsam poplar (*Populus balsamifera*) at 70% with white spruce (*Picea glauca*) (10%) and some small concentrations of white birch (*Betula papyrifera*). Red osier dogwood (*Cornus stolonifera*), beaked hazelnut (*Corylus cornuta*), prickly rose (*Rosa acicularis*) and mountain

ash (*Sorbus americana*) were all found in the understory. Relative to the previous stand 6834 and 6370, there is a larger concentration of mature Manitoba maple (*Acer negundo*) in both the overstory and understory which is considered a significant invader species in Alberta (Invasive Alien Plants in Canada, 2008). Caragana (*Caragana arborescens*) stems were noted along trail edges. Black knot on cherry was noted.

There are at least 3 prominent vehicle trails that were encountered and many pedestrian trails, BBQ sites are also present throughout the southwest end of this stand. The poplar appears older at an estimated age of 60 to 65 years with younger white spruce in the 45 – 50 year age class.

The plant community type was assessed as “PB. 3 red-osier dogwood” as per the Urban Ecological Field Guide for the City of Edmonton. The overall forest health assessment score was in the “healthy with problems” range at ~ 55%. This is largely due to cumulative impacts of soil compaction from trail use, significant presence of Manitoba Maple and caragana as well as low numbers of regenerating stems.

6608 - This stand lies north of the ring road and extends towards Royal Mayfair Golf Club. UrbFor could only assess the portion of the stand to the south of the existing fence. The overstory trees species include balsam poplar (*Populus balsamifera*) (70%) with more abundant white spruce (*Picea glauca*) (20%) to the east end of the stand and some aspen (*Populus tremuloides*) (10%). There are many standing dead spruce throughout. The understory species include beaked hazelnut (*Corylus cornuta*) and red osier dogwood (*Cornus stolonifera*). There is reduced structural diversity: regeneration is less prominent than stands 6834 and 6370 and saplings are in much lower density and distribution. Caragana *Caragana arborescens*) covers a large area on the south edge that extends ~ 100 metres in length. Siberian elm (*Ulmus pumila*) and Manitoba maple (*Acer negundo*), which are both invasive species in some parts of Canada when they escape cultivation, were noted. There were bird cages nailed to trees in this stand and older containers against the fence line. There are many concentrations of dead ladder fuels and this combined with standing snags may pose a fire risk during dry conditions. This stand has the largest concentration of thistle (*Asteraceae* family) on the south perimeter.

The plant community type was classified as “CLM. 3 mixed shrubs” as per the Urban Ecological Field Guide for the City of Edmonton. The overall forest health assessment score was in the “unhealthy” range at ~ 30%. This is largely due to the dieback observed in the spruce and large extent of invasive species, namely caragana, Siberian elm and thistle.

6497 - This stand lies east of the ring road and extends toward Groat Road, almost covering the entirety of the eastern perimeter of the park. The overstory consists of mostly balsam poplar (*Populus balsamifera*) (60%) and trembling aspen (*Populus tremuloides*) (30%), with white spruce (*Picea glauca*) and balsam fir (Abies balsamea) making up the remaining species composition. The balsam poplar reaches up to ~ 15 metres and has aspen growing 2

meters below at 13 metres tall. The small amount of spruce and fir reach 10 metres. The understory consists mostly of red-osier dogwood (*Cornus stolonifera*) (40%) and beaked hazelnut (*Corylus cornuta*) (30%), with a small amount of prickly rose (*Rosa acicularis*) (10%) and high bush-cranberry (*Viburnum trilobum*) (10%). Manitoba maple (*Acer negundo)* was found in the stand but was mostly concentrated around the edges around the City of Edmonton compound. Caragana (*Caragana arborescens*) was also located in small batches in the stand extending to an inclining slope leading to Groat Road in the south-eastern portion of the stand. There is a significant amount of spruce and fir saplings spread throughout the stand ranging between 0.5 metres to 5 m height. A 10% mortality of the crown was also observed in the northern portion of the stand and large portions of dead fall were seen throughout.

There are two trails that cut through the stand, a horseback trail and a trail leading to stairs ascending the slope up to Groat Road, as well as a cutline leading from the City of Edmonton compound. The poplar is estimated to be older at 50 to 60 years old than the spruce in the overstory at ~ 40 years old.

The plant community type was assessed as “PB. 3 red-osier dogwood” as per the Urban Ecological Field Guide for the City of Edmonton. The overall forest health assessment score was in the “healthy” range at ~ 85%.

All forest health assessment score sheets are attached as **Appendix 2** Forest Health Assessment Scores.

5.2 Impacts to Open Space Trees

Analysis of construction plans and a comparison using GIS buffers around individual open space trees (**Appendix 3**) has identified a total of 741 conflicts (**Table 7**). These conflicts or disturbances have potential to cause injury to individual trees. The mechanisms of those injuries could include:

- Soil compaction/ contamination
- Root cutting or damage
- Grade changes that redirect surface water
- Crown injury including broken branches / burns to foliage
- Trunk damage / wounds
- Excessive fill over roots, against trunk
- Damage during installation of surface infrastructure

The results of the initial overlay exercise identified the following:

Table 7. Summary of Impacts to Open Space Trees.

	Numbers of Trees	Comments
Total number of open space trees impacted – within TPZ	741	The City of Edmonton requires that all trees that fall within 5 metres of any boulevard and open space tree (as measured from the edge of the trunk of the tree) be identified
Total estimated number of trees to protect	544	The final number of trees to protect may change subject to further field assessment.
Total estimated number of trees to remove	112	The final number of trees to remove may change subject to further field assessment.
Trees impacted by current grading and COE protection requirements	85	Follow specifications as per the Design and Construction Standards. 2022. Volume 5 Landscape.
Commemorative trees identified within the development site	35	These trees may not have any planned disturbances within 5 meters. However, they are identified specifically on the Overview Maps.

Scaled maps showing the required protection for each of the impacted trees in open spaces have been drafted for 19 areas – see **Appendix 4** Overview Maps.

5.3 Grading/ Cut and Fill Plan

A final cut and fill plan was produced by Watt Consulting Group on March 3, 2023. The Cut and Fill Plan (Watt Consulting Group) was layered over the open space tree inventory (UrbFor) for analysis of grading conflicts with individual open space trees. This analysis identified potential injury to 85 individual open space trees due to proximity to planned grading.

6.0 Recommendations

Recommendations for the preservation and protection of natural areas and open space trees is based on key objectives for

i. Controling erosion and sediment loss
ii. Limiting drainage impacts
iii. Soil stabilization of cut and fills
iv. Mitigating soil compaction

The best management practices to meet these objectives for natural areas and open space trees are outlined below.

6.1 Natural Areas

6.1.1 Erosion and Sediment Control

Erosion and sediment control mitigation measures for natural areas included in this report draws from the Temporary Erosion and Sediment Control Plan (TESCP) prepared by CPP Environmental in March 2023.

The fundamental objective of that plan is as follows:

"*to prevent erosion and manage eroded sediments associated with project works. More specifically, this TESCP provides erosion and sediment control measures over the underground utilities construction and stripping and grading period from mid-March 2023, to end of October 2023*."

The general best management principles to be followed throughout this project include the following:

- Plan in phases to avoid having large areas of exposed soils. This involves stages of construction activities
- Limit the timespan of the vegetation clearing phase as ground cover is the most important factor in controlling erosion and preventing soil loss/movement
- Revegetate cut and fill slopes as soon as possible and as work progresses
- Stabilize areas after final grading; mechanical (e.g., track pack), vegetative (hydro seed) or a combination (hay/seed track crimping) can be used
- Plan to minimize water velocities and contributing areas. Avoid long slopes of low (<5%) to moderate (<10%) grade
- Break up extended slopes with benches, terraces, or installation of diversion structures (e.g., berms/silt fences/siltsox)

- Install check dams in lower lying areas of concentrated runoff prior to revegetation to reduce water velocity and prevent rill/sheet erosion
- Use existing vegetative buffers or grassed areas to contain and filter sediment laden water from any pumping or temporary drainage activities. In some cases, lined channels may be needed to prevent scour
- Install sediment fences on the downslope side of piled or exposed soil surfaces to intercept sediment and runoff
- Protect stockpiles of soils from erosion by immediately covering them with tarps prior to or during rain and revegetating to an annual crop. If stored for > 1 season, consider more permanent cover and/or top dressing with the salvaged Organic layers to promote natural establishment of vegetation.
- Store soils away from watercourses and away from areas that would normally flow into waterways or storm sewers during periods of snowmelt or rainfall.
- If possible, ensure vegetated buffers are maintained or silt fences are installed around stock piles to prevent erosion and soil loss.
- Ensure vegetative buffers are clearly marked and equipment is prevented from clearing/disturbing or damaging integrity of buffer strips.
- Ensure that all workers are educated on objectives and measures in place to reduce erosion and prevent sedimentation. Have a copy of the erosion and sediment control plans on site.
- Ensure enough materials are on site to properly protect soils once work is commenced.
- Be aware of expected weather forecasts and take appropriate steps to ensure projects are not left with exposed soils or unprotected areas during heavy periods of rainfall.
- Install stormwater filters at inlets to prevent sediment from entering storm sewers; install catch basins at outlets to allow for any introduced sediment to be recaptured.
- Ensure all structures and erosion control methods are inspected after rainfall, snowmelt and/or freeze-thaw cycles to ensure structures are functional and in good repair.
- Follow City of Edmonton Erosion and Sedimentation Control Field Manual (January 2005)

An erosion and sediment control matrix (**Appendix 6**) was created to identify those specific practices to be carried out by the following activity type:

- Deep trench
- Shallow trench
- Surfaces including flat areas, roads, trails, parking lots and final grading/ landscaping
- Soil stockpile/ laydown areas
- Outfall
- Storm water management areas

Relevant best management practices (**Appendix 7**) have also been provided for specific BMPs identified below.

Table 8. Recommended Best Management Practices for Erosion and Sediment Control.

BMP Number	Description
1	Sediment control – Silt fence
4	Sediment control – Continuous perimeter control structures
5	Sediment control – Berm Interceptor
6	Sediment control – Storm drain inlet sediment barrier
7	Erosion and sediment control – Rock check dam
10	Erosion and sediment control – Synthetic permeable barrier
13	Erosion control – Rolled erosion products
22	Erosion control – Seeding
23	Erosion control – Mulching
24 a	Erosion and sediment control – Hydroseeding
27 a	Streambank stabilization – Live staking
27 b	Streambank stabilization – Brush layering
30	Erosion and sediment control – Riparian zone preservation
31	Erosion and sediment control – Silt control systems
32	Erosion and sediment control – Scheduling
33	Erosion and sediment control – Stabilized worksite entrances
34 (a-c)	Sediment control – Slope texturing
37	Erosion control – Compost blankets
38	Streambank stabilization and erosion control – Rolls
45	Streambank stabilization – Vegetated riprap
M3*	In-stream sediment control – Cofferdams
M4*	In-stream sediment control – Instream silt barrier
*BMPs (M3, M4) only for in-stream works, consult QAES and ensure proper approvals are in place for in-stream works and activities. Source: AB transportation Fish Habitat Manual: guidelines for watercourse crossings in Alberta (August, 2009)	

The following tree care recommendations are outlined for planned disturbances within or adjacent to natural areas:

i. Retain a project arborist to oversee all planned disturbances and operations within the natural areas.
ii. All disturbances are to be staked in the field and reviewed by project arborist prior to construction.
iii. All exposed roots > 2.5 cm diameter to be pruned by an ISA Certified Arborist
iv. Any tree that is destabilized due to root injury from excavation must be assessed by a qualified ISA TRAQ assessor; Arborist recommendations for tree removal require the authorization of a City of Edmonton Forester prior to removal work being conducted.

v. All anti compaction within TPZ should be rig mats or equivalent and all anti compaction between TPZ and specified distances should be 20 cm (8 in) mulch with plywood on top.
vi. Boring equipment shall be outside the 5 meter/10-meter distances unless anti-compaction measures are in place
vii. Site specific watering of trees in natural areas will be prescribed during the construction phase and will be subject to soil and weather conditions at the time including temperatures, relative humidity and windspeeds.

A summary of site-specific erosion and sediment control measures as well as mitigation for each of the planned disturbances within the natural area is included in **Appendix 8. Natural Area Preservation Plan.** This includes the new storm installation for Outfall #27 in the north-west part of the park.

6.2 Open Space Trees

A summary of disturbance and injury mitigation measures for excavation and grading includes the following:

i. Avoid cuts and fills within the TPZ if possible
ii. Use of top soil high with 5% organic matter for fills as this allows for water infiltration and gas exchange
iii. Do not use low permeability soils (e.g., clay) for fill
iv. Preserve at least 70% of the root system to maintain a healthy tree
v. Any roots > 2.5 cm diameter must be pruned by a qualified arborist
vi. Avoid all soil compaction within the TPZ (e.g., prevent staging or movement of machinery within the TPZ)
vii. Install root zone disturbance/root injury mitigation measures where major grade changes are required (e.g., tree wells, retaining walls, or tree islands).
viii. All curb and asphalt removal will comply with Asphalt Milling and Curb Removal Procedures (**Appendix 10**)

Generic tree protection designs have been drafted to guide the work within or adjacent to tree roots. They are outlined in **Table 9.**

Table 9. Summary of Design Drawings to Guide Construction Practices Within TPZ.

#	Title	Version (year/mm/dd)
T1	Pavement and Curb Replacement – One Side	20230327
T2	Pavement and Curb Replacement – Two Sides	20230327
T3	Shared Use Path (SUP) - Gravel	20230327
T4	Directional Drill/ Case Boring	20230327
T5	Open Cut	20230327
T6	Trench Box	20230327
T7	Air and Hand Tools (Path construction/Utility Installation)	20230327
T8A	Light Standard - Existing	20230327
T8B	Light Standard – New Install	20230327
T9A	Catch Basin/Manhole – Abandon in Place or Remove	20230327
T10	Grading	20230327

Trees potentially impacted by the cut and fill plan are to be protected. The T10 Grading design included in **Appendix 9** will provide the guidance for protection of these trees. This grading design considers the following species and soil interactions:

i. Species tolerance to development impacts
ii. Rooting patterns and depth
iii. Fill type and soil texture
iv. Tree vigor
v. Depth of fill

The following outlines tree preservation procedures by phase.

6.3 Pre-Construction

i. Appoint a project arborist (PA) to monitor tree protection; this is a third-party ISA Certified Arborist with a minimum 5 years experience monitoring trees through construction activities
ii. Site walk throughs will be arranged by the Site Superintendent and include key project stakeholders including City of Edmonton Urban Forester, Engineers, and

Construction Lead Hands. Site walk throughs will discuss projected site phases and works 4-6 weeks in advance of work commencing.

iii. During the 'walkthroughs', site specific open space trees and natural area impacts as well as mitigation options will be discussed. Key decisions will be recorded by the city forester and the project arborist

iv. If project scheduling allows, document all trees under full "leaf out" condition with photographs to assess tree crown health and tree vitality

v. Record the presence of insects or pathogen in populations or densities known to be damaging to the host species

vi. Label all trees with metal tags prior construction; tree tags to be nailed using minimum 2.5" aluminum nails within 10 cm of grade on the north side of trunks and are to remain attached until final landscaping phase. This includes both trees to be protected and removed; tree labels must match all those on the overview maps

vii. Ensure that tree protection fencing dimensions/specifications meet those as approved by the City of Edmonton and the spring of 2023 Tree Preservation/ Protection Plan prepared by UrbFor Consulting Ltd.; confirm that all fencing is installed at the locations shown on the tree protection plan

viii. Metal fencing (**Figure 4)** is being used until soil conditions allow for more permanent anchoring.

Figure 4. Metal Fencing Design for Open Space Trees and Natural Area Perimeter.

ix. There will be no breaks in the fencing as this will provide compaction avoidance.
x. Fencing posts should be installed in the ground for the duration of the construction period
xi. The PA will periodically inspect that tree protection signage is present on all trees requiring protection measures
xii. The PA will recommend tree crown pruning for clearance on trees identified as having above-ground conflicts with construction activities or installations
xiii. Adhere to City of Edmonton Bylaw 14600: Community Standards Bylaw, Part V (elm tree removal, elm tree pruning)
xiv. Establish a concrete spoil area away from tree root zones and without flow paths into tree protection areas; alternatively, use a containment system to prevent contamination of the TPZ; ensure there is compliance monitoring during construction
xv. Pending weather conditions, the PA will pre-condition trees using injection watering on as needed basis
xvi. Before any of the site clearance or demolition work begins, key project stakeholders including: the PA, a developer's representative, civil engineer, the contractor's site superintendent and City of Edmonton (COE) Urban Forester, will attend a pre-commencement meeting
xvii. The PA is to review the form and location of the fencing and ground protection used as barriers for the construction exclusion zone
xviii. Chandos Construction Ltd. is to get agreement by COE on fencing locations prior to any development

6.4 Tree Protection During Construction

i. The PA is to inspect the worksite bi-weekly (or at an agreed to interval) to ensure that the integrity of the tree protection zones (TPZ) are maintained and plans are being adhered to, including:
   a. no equipment, vehicles or materials are stored within the TPZ
   b. no service installation or excavation
   c. there is no deposition of concrete wash materials in the TPZ
   d. there are no grade changes, trenches or root cuts in the TPZ
ii. During the 2023 to 2027 growing seasons, the PA will monitor Environment Canada historical weather data and assess soil moisture throughout the TPZ's; schedule watering as required throughout the 2023 to 2027 growing seasons
iii. Soil moisture will be sampled by the PA throughout the project area where potential root impacts may be experienced; low impact soils sampling methods will be used (e.g., Dutch auger) along with manual texturing to assess existing soil moisture and subsequent watering requirements

iv. The PA will recommend to the COE Urban Forester branch pruning for clearance from construction activities and installations as required
v. The PA will be on site at time of utility removal and new construction and where injuries to roots > 2.5 cm diameter to a depth of 50 cm are required, perform pruning where City of Edmonton Forester authorization is granted
vi. The PA will monitor tree health, changes in tree stability and/or tree damage (trunk or branches); further, impacts to trees during construction will be documented. Tree health and condition monitoring will focus on the following indicators: short annual shoot elongation and small yellow leaves, thin foliage and leaf scorch, wilting, early fall coloration and defoliation, epicormic shoots; twig / branch dieback, wounds from equipment damage on trunks and lower branches, attack by borers and other stress related pests, decay at wound sites (long term)
vii. Inspections of trees after major wind events for branch or full tree failures will be carried out by the PA and remedial treatments including pruning, bracing/cabling and removal will be recommended to the City of Edmonton Urban Forester
viii. Written records of monitoring summaries will be circulated as needed to relevant parties including the City of Edmonton urban foresters by the PA
ix. Deliverables to the Senior Project Manager of Chandos Construction (Dylan Buchanan) include:
    a. Inspection results and photographs of impacted trees associated with each site visit; this will be in email form with attachments
    b. Annual summary of monitoring reports by year for 2023 to 2027 (all field reports to be numbered sequentially)
    c. Report any condition requiring attention that is beyond the original scope of work to the Site Superintendent and directly to the City of Edmonton urban foresters

6.5 Landscape Phase

Implementation of natural area and tree protection plans shall be continued through the landscape phase. The project arborist will continue to monitor or follow up on

i. Removal of tree protection fencing and any temporary irrigation systems
ii. Minimizing tree and root damage during installation of the landscape plants, hardscape, irrigation, drainage, and lighting infrastructure
iii. Mitigation of damaged plants, including but not limited to pruning, watering, mulching or removal and replacement

Any prescribed treatments will be put forward to the City of Edmonton Urban and Natural Area Foresters for consideration and review.

6.6 Post Construction

At completion of the construction phase, trees identified as impacted in this report and those trees identified as impacted during the course of construction phases shall be inspected by the project arborist for any change in condition. Any remedial treatments shall be prescribed and undertaken by an ISA Certified Arborist. This work including removals, pruning, stump grinding as well as possible cabling/bracing will be coordinated by the City of Edmonton Urban Forestry at the cost of the project as per Corporate Tree Management Policy C456C.

All tree tags to be removed.

7.0 Construction Schedule

A comprehensive 6-week lookahead schedule and Gant chart (**Appendix 11**) has been provided.

The 6-week lookahead describes all tasks for site services, paving, site walks and tree removal to May 21, 2023. The Gant chart represents all tasks by start date and finish date for the entire project including Final Acceptance Certificate in September of 2026.

As of April 13th, and in accordance with Public Tree Permit issued for Phase 1 (**Appendix 12**), there has been work carried out including deep utility installations, selective demolition within the amphitheater and maintenance yard. Asphalt milling has been completed for the ring road.

Further tree removal work however is contingent on the submission and review of this tree preservation plan that encompasses the entire work area.

LIMITATIONS

This report has been prepared for the use of Chandos Construction Ltd. relative to the proposed project described in the report. The quality of the information and the conclusions are based on information at the time of preparation of the report. This includes data supplied by third party sources.

The Consultant makes no representation of fact or opinion of any nature whatsoever to any person or entity other than the company, organization or individual to whom this report is addressed. UrbFor Consulting Ltd. denies any liability whatsoever to other parties who may obtain access to this report for any injury, loss or damage suffered by such parties arising from their use of, or reliance upon, this report or any of its contents without the express written consent of the author and the client.

Subject to the following conditions and limitations, the investigation described in this report has been conducted in a manner consistent with a reasonable level of care and skill normally exercised by members of the urban forestry consulting profession currently practicing under similar conditions in the area.

The assessment described in this report has been limited to the scope of work described in discussions between UrbFor Consulting Ltd. and Chandos Construction Ltd. in March 2023.

The possibility of contamination from past activities on the property and the impact to tree root systems and future tree health, or other public safety risks, were not included in this assessment.

UrbFor Consulting Ltd. assumes no liability for the trees that may be impacted by construction activity involved with this development. UrbFor Consulting Ltd will not be held responsible for any damage to the trees on site or any replacement costs.

CLOSURE

This report has been prepared and submitted by UrbFor Consulting Ltd as documented above. We trust that the information presented is suitable for your needs. Should you have any questions, please contact the undersigned at (780) 288-8680.

Sincerely,
UrbFor Consulting Ltd.

Andre Savaria RPF #317
ISA Certified Arborist PR-4880A

List of Appendices

(Appendix 1 through 13 were submited separately to this report)